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ANNUAL REPORT

OF THE

GOVERNMENT EXPERIMENTAL FARM

POONA,

For the year ending 31st March 1893.

ANNUAL REPORT OF THE GOVERNMENT EXPERIMENTAL FARM, POONA, FOR THE YEAR ENDING 31ST MARCH 1893.

I have the honour to submit herewith the Annual Report of the Poona Farm for the year 1892-93

Season.

2. The regular monsoon did not burst until about the 30th of June. Over nine inches of rain fell previously as ante-monsoon showers. This facilitated early sowing, flushed grass into vigorous growth, and dispelled fears of scarcity which previously existed. The irrigation canals of the district partially failed during April and May, and fodder and food-grains approached famine-prices.

3 The character of the season was unusual. The rainfall was much above the average. Rain fell unseasonably. The heavy rainfall during October proved disastrous to cereals ripening at the time, particularly to bájri, which is the staple of the Poona District and of the light land of the Deccan. The grain sprouted in the ear and the straw rotted Many cultivators lost heavily although they took the unusual precaution of stooking the crops in the fields and hooding the stooks to protect the grain. On the farm the heavy down-pour of July flooded two of the fields, so that they were inaccessible for weeks, spoiled a very promising crop of fodder jowári, rotted several plots of lucerne (as it did many of the fields of the district), and washed away first sowings necessitating a second seeding.

4 The following table compares the rainfall of the season with that of 1891 and with the average of the preceding seven years —

Rainfall Return.

Months.		1891		1892		Average of seven years (1885—91)
		Rainy days	Inches.	Rainy days	Inches	
May	1st fortnight	2	0 60	1	0 05	1 89
	2nd „	.	...	3	1 23	
June	1st „	...	...	8	4 62	4 35
	2nd „	3	0 50	8	3 15	
July	1st „	9	1 84	13	11 06	8 31
	2nd „	13	7 43	12	1 36	
August	1st „	12	1 43	9	1 16	2 88
	2nd „	9	1 34	9	1 83	
September	1st „	4	0 87	11	2 87	7 13
	2nd „	2	0 78	7	2 52	
October	1st „	5	3 41	4	1 57	5 27
	2nd „	...	..	10	13 24	
November	1st „	...		1	0 41	2 18
	2nd „	...	...	...	...	
December	1st „	..	..	...	.	0 58
	2nd „	...	..		..	
	Total .	59	18 20	96	45 07	32 59

5. The following table shows the areas under different crops during the year under report:—

Statement showing the Area under Cultivation, 1892-93.

Crops.	Area. A.	g.	
"Shálu" Jowári	2	22	A variety of Sorghum vulgare, usually grown in the "cold weather," whence its name.
Bájri	0	32	
Maize	0	25	
Potatoes	1	23	
Sugarcane	0	12	
Wheat	0	12	
Gram	4	15	
Lucerne	1	17	
Guinea grass	3	7	
Rye	2	22	
Various fodders	26	23	
Vegetables	1	3	
Fruit trees	0	30	
Cape gooseberry, &c.	0	30	
Total ...	46	33	Of which 9 acres 22 gunthas were twice cropped.

Experiments.

6. Only a small portion of the Poona Farm is suited for manure and other comparative experiments. The only area which can be utilised consists of two small fields situate within the limits of the old Botanical Gardens, which at one time were the property of the Agri.-Horticultural Society of Western India. The whole of the garden land is good although somewhat irregular in character. It is, however, (with the exception of the two fields referred to) overshadowed by road-side and fruit trees, and this makes it unsuited for experimental work, the results of which are gauged by the weigh-bridge. On the other hand, although the most of the farm consists of uneven light land, there is fair scope for experiments like those carried out during the year under report and which I will endeavour to describe.

Fodder Experiments.

7. These experiments were instituted to find out whether well-known fodders, which are not indigenous to India, or if indigenous are cultivated in other districts, could be substituted economically for those commonly grown in the Deccan. The conclusions so far are that exotics have for the most part proved themselves failures, that some of the common millets and sorghums under liberal cultivation yield heavily and are as fodder crops difficult to improve upon, and that one variety (the Sundhia of Gujarát) on account of its special value as a fodder crop should be more widely cultivated than it is at present.

8. The outturn weights per acre of the fodders grown form by no means a true guide as to respective values. Nutritive values vary (but how far without analysis we can only estimate), and there are differences regarding the economy with which a given weight of each variety can be fed to milk cattle or any kind of domestic stock.

9. The fodders which were compared were soiled green to highly fed milk cattle. There was much more wastage with those fodders which had coarse stalks than with those which had not. It may be argued that if fed green to the ordinary stock of the country there would have been no waste at all and the difference in value would have at once been eliminated. This is true only to a certain extent, because all fodders with coarse stalks have not such a high nutritive value as those with less fibrous tissues. The differences in this respect between varieties can be, to some extent, controlled by sowing the seed thickly. This causes nearly all fodder plants to produce long thin stalks and I believe ordina-

rily increases the outturn also. Thick seeding will, however, only give good results if the soil is either naturally rich or well stocked with manure and if (failing a good rainfall) irrigation water is available. I have no figures to prove the relative value of thin and thick seeding, that is a point for future enquiry; but practical observation inclines me to believe that very thick seeding is advantageous. I must however make an exception of two crops (maize and Reana luxurians). Both require more space between plants than any of the millets or Sorghums. If the maize and Reana plants are crowded the crops become stunted.

10. I put in tabular form below yields per acre, the values of outturn, and the cost of cultivation of various fodders of the cereal family. Leguminous fodders were also tested and results of these I will refer to further on. The figures given below are not so much for comparison *inter se* as to show results of liberal farming on ordinary soil :—

Crop.	Outturn in lbs. per acre.	Cost of cultivation.	Value of produce.	Rate in lbs. per Re. (Poona).	Remarks.
	Lbs.	Rs. a. p.	Rs. a. p.		
Guinea grass ...	35,028	109 12 2	233 8 2	150	Crop cut ten times during year. Grown on poor light land. Much better results got from other plantations, but as these were established during the year, results therefrom for a whole year cannot be now given.
Nilva Jowári, Sorghum vulgare.	17,787	45 1 1	71 2 4	250	This crop followed country peas which failed. The tillage expenses and manure for both crops charged against the Nilva.
Maize	17,850	29 7 4	59 7 11	300	This fodder is coarser than the millets and worth less.
Sundhia Jowári Sorghum cernuus.	18,690	44 2 0	74 12 0	250	The best fodder millet in cultivation.
Reana luxurians...	21,246	54 4 4	84 15 9	250	This result was from two "cuts." A duplicate plot was cut five times. It was proved that only the first two "cuts" paid. The last three were produced at a loss.

11. I have already said that the outturn figures do not fairly represent the feeding value of fodder crops. Below I tabulate the order of superiority of the various cereal fodders as to feeding value. In arranging the order I have been guided not so much by the actual nutrient value as by the preference shown by cattle for one fodder over another and by the relative wastage in feeding one kind of fodder as compared with another. I note remarks against each kind of fodder crop which may assist growers :—

Order of superiority.	Remarks.
1st.—Guinea grass ...	A very fine fodder; yields well; no waste in feeding; greedily eaten by all description of live stock; grows best on ridges, which should be two feet apart. Plants should be eighteen inches apart in the rows. Apply manure heavily and give plenty of water. Guinea-grass grows well in damp situations and under shade. Propagated either from seeds or "sets"; the latter, best.

Order of superiority.	Remarks.
2nd.—Sundhia Jowári (Sorghum cernuus).	Stalks very tall and very thin. No waste in feeding. Cultivated largely as a fodder crop in Gujarát. Grain head very poor. Seed should be sown by drill, first length-wise and then across field. This secures even distribution. Seed rate 50 to 60 lbs. per acre. Sow in June or for hot weather irrigated crop in February to March. Rain crop in flower and ready for cutting as fodder 60 days after sowing. Crop rather more subject to rust, in cloudy weather and to lodge in wet weather than ordinary jowári.
3rd.—Shalu Jowári (Sorghum vulgare.)	A cold weather crop which can be advantageously irrigated. Sow seed in rows 11 to 13 inches wide. 25 to 30 lbs. seed per acre for a fodder crop. Stalks sweet, but short and rather coarse. This fodder is greedily eaten both green and dry by milch cattle. Outturn is however comparatively light.
4th.—Nilva Jowári (Sorghun vulgare.)	Stalks very tall and moderately thin if seed is sown thickly. Seed-rate for fodder crop about 50 lbs. per acre. Drill seed in rows 11 to 13 inches apart in June. This crop grows in the rains nearly as quickly as Sundhia and outturn on rich land very heavy. Does not grow well late in the kharif season, when Utavli (another common variety) should be substituted.
5th.—Teosente (Reana luxurians.)	Stalks tall, but coarse and fibrous, leaves also coarse, but liked by cattle. Plant tillers freely. Seed should be sown by dropping it by hand into every second furrow made by a plough. The plough in making the next furrow covers the seed. 5 lbs. seed per acre sufficient. Single the seedlings, to 15 inches apart. On heavily manured land, the crop is ready to cut in 85 days. If a long stubble is left Reana shoots up vigorously a second time, and yields a second cut in 7 weeks. Subsequently the shoots are less vigorous, and the crop fails to produce profitable "cuts".
6th.—Maize, Zea mays ...	Grows vigorously in rich land. The seed for a fodder crop should be sprinkled by hand, 45 lbs. per acre, in every 2nd furrow, made by a plough, crop is ready for cutting as a fodder when male flowers appear, about 65 days after sowing. Stalks tall, but very coarse near the root end. Lower leaves get coarse and fibrous when the upper leaves are yet young and growing. Milch cattle reject the coarse stalk.

12. (Imphi). During the year African sugarcane, Sorghum saccharatum (Imphi) was also tried as a fodder. Flood water during heavy rains swept the field and damaged the crop. The experiment, which was inconclusive, will be repeated.

13. (Oats). A fodder crop of oats was nearly a failure. The seed was sown under favourable conditions in June. In July heavy rains swamped the field and subsequently the heat forced the crop prematurely into ear. The season was undoubtedly unfavourable, but even if it had been favourable I doubt if the best possible oat crop could compare favourably with a middling crop of fodder jowári. Oats, as a hay crop, are said to have proved successful at the Remount Nursery Farm, Ahmednagar.

14. It is quite possible to show the superiority of Sorghums, millets and plants of the cereal order as fodders. But (excepting Guinea grass) it is quite impossible to grow them continuously. Consequently systematic rotation must be practised. On an Indian dairy farm the land should be principally under fodder crops, and as the practice of growing any cereal continuously induces unhealthy condition of the crop, the question naturally arises, what crop or crops can most advantageously be rotated with the cereal. This problem has received some attention on the Poona Farm in the year under report, and as no very satisfactory results have been yet attained, it is the subject of further enquiry. Crops of the Leguminous order are of course best adapted for rotation. As far as our experiments have yet gone exotics have failed signally.

15. Vetches (Vicia sativa). Vetches or tares, almost, if not the best, forage crop of England gave no promise of ever being a success. The seed germinated well, but the seedlings only grew into dwarfed plants, which it was difficult to recognise as ordinary vetches. Only a few

flowers were produced and these did not fertilize or at least they produced no seed.

Sainfoin.

16. Sainfoin, an English clover, which delights in a light limestone soil and has an extraordinary power of resisting drought, did worse, for, although the seed germinated the seedlings soon died away. This crop was tried twice in the rains and in the cold weather with seed imported twice in tin-lined cases and with each time the same result.

Flat pea (Lathyrus sylvestris).

17. Professor Wagner's Lathyrus sylvestris, the seed of which was obtained direct from his accredited London agent, has not in India proved itself the "great fodder plant," which it is called by the seed-seller. The seed has been widely advertized and its sale has been pushed in India with considerable success, probably because it is so dear. It is but fair to warn the public what the result of purchasing seed will be. The plant has proved itself on the Poona Farm a miserable failure as it has done elsewhere in India. It is described as an improved form of a weed. The wild plant has a poisonous narcotic principle. It is very probable that the produce of the improved seed may revert to the wild form in India. But it is not at all likely that the poisonous principle will ever endanger the stock of the country! The plot on the Poona Farm has survived more than a year, but in the hands of an ordinary cultivator it would have been extinct long ago, because the expenses incurred in weeding and watering have already far exceeded any prospective return, which the most enthusiastic cultivator could forecast. I must give the plant credit for enormous root development, but unfortunately this growth is in the wrong direction for, nothing that could be called fodder, has yet been gathered.

Country Peas.

Kulthi (Dolichos uniflorus).

18. The indigenous leguminous crops selected for trial as fodder crops this year, did not prove successful. Country peas grown in the rains mildewed and the yield was insignificant. Kulthi (Dolichos uniflorus) on medium black land in rich condition did not, as a rain crop, give promising results. On poor light land it did much better. A test area taken as average of the light land crop gave a yield equivalent to 7,912 lbs. per acre of green fodder. There is considerable wastage in feeding kulthi to highly fed cattle; milch buffaloes reject the coarser stems, but eat greedily the leaves and young tender shoots. Kulthi must therefore be classed as only a moderately successful fodder rotation crop. Experiments that are in progress indicate that two other indigenous pulses will prove much more satisfactory. These are Wál (Dolichos lablab) and Cholá (Dolichos catiang). Both grow in good land luxuriantly in the rains and thrive also as rabi crops. Unlike kulthi they do best in deep good soil.

Wál (Dolichos lablab).

Cholá (Dolichos catiang).

Lucerne.

19. The season was unfavourable for the lucerne crop of the district. Many of the fields round Poona were submerged by the heavy rains of July and the crops were completely destroyed. Those grown in the bed system fared worst. The ridge and furrow system afforded some protection, because the plants were not directly in contact with the water, and the water drained away more freely. But the ridge system of sowing was no safeguard against a fungoid disease which attacked the roots and destroyed many fields, including a good deal of that grown on this farm. This disease has been observed for a year or two. This year owing probably to the wet season it was more disastrous than usual. The combined effect of a bad season and disease was to raise the value of healthy crops considerably. At one time during the season lucerne could not be bought cheaper than 60 lbs. per rupee.

20. The experience of this year proves that lucerne in the Poona District is a delicate crop liable to many mishaps. If it is sown at any season except early in the rains or between October and December it is apt to be attacked by aphides or eaten by caterpillars, while the seedlings are still young. If it remains healthy which, during the last two seasons, is the exception rather than the rule there is perhaps no more profitable crop to grow, but if it fails a considerable amount of invested capital is sunk, because the initial outlays in

establishing the crop are heavy. With the exception of one plot all others on the Poona Farm were either damaged by rain or by disease during the year. It is noteworthy to mention that one piece of lucerne, which had become patchy through disease, was filled up by planting Guinea grass. The mixed crop corresponding to the "Rye grass and clover" of England has done exceptionally well, and the lucerne plants are now quite healthy. I tabulate below the result of manure experiments on lucerne. The plots selected were as equal in character as it was possible to get them on the farm. The manures tested were (A) Farm-yard manure, (B) Castor cake, (C) Bones crushed into small pieces, (D) Bones similarly crushed and fermented in a pit for several months with earth and stable urine. As near as possible an equivalent value of each kind of manure was applied per acre. The results are of little value because they were vitiated by the fungoid disease, which appeared (first in the farm-yard manure plot) just when the crop was well established. The figures afford useful comparison with results from a healthy crop which I will note further on. Copper sulphate applied in solution with lime had no appreciable effect in checking the disease. The farm-yard manure plot was affected earlier and to a greater extent by disease than any of the others.

	Weight in Lbs. per acre.	Cost of cultivation per acre.	Value of produce per acre.	Remarks.
	Lbs.	Rs. a. p.	Rs. a. p.	
1st Plot	26,860	133 4 4	223 13 4	Sown in June 1892, cut first time in September 3rd to 16th, 1892, ninth cut finished 15th March 1893, attacked by fungoid disease. Manured with 15 tons per acre farm-yard manure before sowing and 7 tons per acre every second time of cutting.
2nd Plot	29,824	143 3 8	248 8 4	Sown in June 1892, cut first time 2nd to 8th September, ninth cutting finished on 16th March 1893, crop attacked by fungoid disease. Manured with 7½ cwt. per acre, castor cake before sowing and 3 cwt. per acre after every second cutting.
3rd Plot	27,088	149 13 4	225 11 8	Sown in June 1892. Cut first time 1st to 10th September, ninth cutting finished 17th March 1893. Attacked by fungoid disease. Manured with 10 cwt. crushed bones per acre before sowing and 4 cwt. per acre after every second cutting.
4th Plot	28,012	144 3 4	233 6 8	Sown in June 1892. Cut first time, 1st to 12th September, ninth cutting finished on 19th March 1893. Attacked by fungoid disease. Manured before sowing with 5 cwt. per acre crushed bones fermented with stable urine and 2 cwt. per acre of the same manure after every second cutting.

21. Below I give the results of general lucerne cultivation. Produce charged at 120 lbs. per rupee :—

	Lbs. per acre during season.	Cost of cultivation per acre.	Value of yield per acre.	Remarks.
	Lbs.	Rs. a. p.	Rs. a. p.	
Lucerne after sugarcane, which was heavily manured.	83,793	330 6 0	698 4 8	Crop sown early in June 1892, manured with farm-yard manure applied in October, December and February. Total quantity of manure 111 tons per acre. Crop quite healthy. Cut first time, 4th to 23rd September and tenth time between 5th and 31st March 1893. Value of manure applied Rs. 111 per acre.
Lucerne after potatoes.	30,420	201 12 10	253 8 1	Crop sown early in June 1892. Twice top-dressed with saltpetre in June and July, two applications together, 5 cwt. per acre. Farm-yard manure applied in August and September, 22 tons per acre. Cost of saltpetre per Acre... ... ...Rs. 54 Cost of farm-yard manure per acre... „ 22 Total Cost ... „ 76 Crop badly diseased.
Lucerne after ratoon sugarcane, which was heavily manured.	36,696	184 6 0	305 12 8	Crop sown in July. Land rich from manure applied to previous crop. Lucerne only manured once during season. 8 tons per acre of farm-yard manure applied in January 1893. Crop cut 1st time in October 1892, 9th time 18th March 1893.

Bájro and bájri.

22. Bájro or the giant bájri of Gujarát was compared with the ordinary deshi or local variety. There is no doubt as to the superiority of the former; but the season was all against the trial, and the returns from each sort are poor. The bájro is decidedly best. Heavy rain fell when the crops were in flower, and fertilization was thereby prevented. Hence the spikes were only partially filled with grain. This is a common occurrence in wet seasons and was the cause of very considerable loss throughout the Presidency. The improved bájri can only be recommended for cultivation on good land or land in high condition. It would prove probably inferior to the local variety on the light poor soils of the Deccan. Its cultivation by the better class of cultivators would be advantageous and the distribution of the seed to those that are likely to be benefited is being undertaken locally on a small scale.

Potatoes.

23. The cultivation of potatoes imported from England was not so successful on the farm as at Khed. The Khed results have already been separately reported. The potatoes grown on the farm were got from Messrs. Carter and Sons, London, and were landed at Bombay a month later than those cultivated at Khed and long after the proper season for planting. The varieties grown on the farm were "Cosmopolitan","Reading giant","Magnum bonum" and "King of Russets". All varieties reached this country in first class condition for planting. They were planted on the 10th to 12th December 1892 and ripened from the 22nd March to 4th April 1893. The "King of Russets" ripened first, the three

other varieties ten days later. The hot weather forced the crop prematurely to maturity with the result that not only was the outturn poor but the tubers did not keep when stored.

The cultivation returns are as under:—

	Seed, Lbs. per Acre.	Outturn, Lbs. per Acre.	Cost of cultivation per Acre.	Value of produce per Acre.	Remarks.
	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	
English potatoes after bájri.	1,310	4,051	217 6 1	173 8 1	The seed cost delivered at Poona, approximately Rs. 300 per ton. The produce is valued at the current market rate Rs. 96 per ton.

The respective yields per acre were as under:—

Magnum bonum	...	...	5,056 Lbs. per acre.
Cosmopolitan	...	...	4,708 „ „
King of Russets	...	...	3,410 „ „
Reading giant	...	...	2,801 „ „

The "Magnums" kept fairly well, the other varieties (particularly the Russets) were most unsatisfactory in this respect. I attribute this entirely to the fact that the potatoes were cultivated unseasonably, and the practical lesson learned is that imported seed, intended for cultivation on the plains, must reach India not later than the middle of October. It may be well to note here that special care is required in the storage of all exotic varieties during the hot weather and this will I fear prove a formidable difficulty with the ordinary cultivator. There is a risk of theft if the potatoes are stored in a thatched heap outside or in an out-house, and there is no room in the rayat's dwelling for proper storage. During the hot weather in India potatoes should be kept in a cool place and if possible spread to a depth of not more than a foot on a mud floor well coated with cow-dung. In Gujarát a good practice prevails of building the potato heap on a layer of sand taken off the roadways. This sand is mixed also freely through the potatoes. The heap is turned every ten days and tubers, which show signs of going bad, are removed. This method of storage might advantageously be imitated elsewhere.

Potatoes propagated from seed.

24. Seedlings raised two years ago from the absolute seed of the potato plant have been making satisfactory progress. The seedlings have now been propagated from sets three times, and although many have been discarded as worthless, we have several hundreds of tubers of medium size and of good appearance which promise to prove eventually good sorts for general cultivation.

Sugarcane.

25. The experimental cultivation of cane was this year confined to three small plots of $\frac{1}{10}$ acre each. The object of the experiment was to contrast the respective merits of the local Pundia (a tall soft white variety) with two red Cuban canes of more recent introduction. The sugar-borer made its appearance in the local variety, when the shoots were about a foot high, and did a good deal of damage, but although the three plots were contiguous, the borer confined itself practically to the local variety probably because it could eat its way easier into the soft variety than into the harder red canes. Although the crop was watched at night jackals did a lot of damage. This damage was of course more marked on a small area than on a large field. For this reason small plots will never give satisfactory results. The cultivation of sugarcane on a large scale is objected to within cantonment limits and experiments on cane will be discontinued on the Farm. The red canes were distributed among the best cane cultivators at Mundwa and it will be interesting to watch whether these varieties at Mundwa continue to resist the sugar-borer, which each year is becoming more destructive.

Rye.

26. The experiment in the cultivation of rye was undertaken at the request of Colonel Caldecott, Superintendent, Kirkee Gunpowder Factory. The straw of this coarse cereal is valuable for the manufacture of brown gunpowder and as rye grows well on poor land in Europe there was a hope of its succeeding on the light land of the Deccan. The first consignment of seed had undergone some form of fermentation in the tin-lined case in which it was sent and had lost all germinating power. A second supply of seed packed in various ways was received and all germinated equally well. The tin-lined case offered no advantage over an ordinary sack or a wooden case without tin-lining. If the packages had been carried in transport deep down in the hold of a vessel the result would probably have been different.

The trial failed completely. The plant lost its natural habit of sending up straight shoots which grow ordinarily into tall thin stalks. The plants tillered freely and formed a thick close sward all over the field, but only a few dwarfed shoots formed and although these flowered they produced no grain.

Cape Gooseberry.

27. This useful fruit was tried on approximately a ¼ acre plot. The seedlings were raised in a seed-bed and transplanted in August when about 6 inches high. The soil was rich loam carefully prepared and manured. The plants stood 18 inches apart in each direction and were planted on ridges. The irrigation water, which must necessarily be given late in the season, was applied along the furrows. The plants began to fruit in October, but the first fruit was worm-eaten and fell to the ground in large quantities. In December the plantation was in full bearing and continued so during January and February. In March and April the plants showed signs of exhaustion and the fruit was not so large or so good as that produced earlier.

I give below the cultivation returns :—

	Produce per Acre.	Cost of cultivation.	Value of produce.
	Lbs.	Rs. a. p.	Rs. a. p.
Cape Gooseberry	811	98 13 8	95 9 1

It must be noted that the irrigation water was supplied from a well at a much greater cost than that from the canal and if canal water had been available the crop could have been raised at a handsome profit. The fruit is worth 2 annas a lb. and is in considerable request for jam making. A practical trial to determine at what cost Cape gooseberry jam could be made gave the following results. The proportional weight of fruit to crystallized sugar was as 8 : 5. The jam could be made and sold at a fair profit in 2-lbs. bottles at 12 annas each.

English Vegetables.

28. The experimental cultivation of English vegetables was not financially successful. The reason is not that they cannot be successfully grown but that their sale on a Government farm at fair market value is difficult. The rates offered by dealers are very different rates from those paid by consumers and the middleman is a well established evil in India.

The seeds were obtained from Messrs. Sutton and Sons, Reading. Those vegetables which succeeded best were undoubtedly of fine quality. The most conspicuous failures were peas and broad beans. The former mildewed and although the plants grew vigorously they did not blossom as they ought to have done. The broad beans flowered, but the flowers did not fertilize and of course no beans were produced. Turnips and kohlrabi sown early in the rains did well, but second sowings were attacked and eaten up by green fly. On account of insect attack it is quite impossible to grow cauliflower and cabbage during the rains. They do succeed in the cold weather, but even then there is the same risk. Beet root and lettuce did very well in the rains. Tomatoes of many varieties succeeded admirably during the rains and later. Kidney beans of all sorts were grown with more success than any other vegetable tried.

Wheat.

29. Three varieties (soft red and soft white obtained originally by Messrs. Ralli Brothers from Muzáffarnagar) were grown experimentally to test the stability in wheat of consistency and colour. The experiment has been in progress both on the Bhadgaon and Poona Farms for some years and it has been proved that the natural characters of a variety of wheat are quite stable and that it is quite possible to introduce good varieties into districts where poor varieties are grown without any risk of the new introduction changing in character, provided it suits the soil and climate of the district into which it is introduced. The wheat plots on the farm were attacked with rust to a most unusual extent. The crops when in flower gave promise of yielding well. Three weeks later owing to rust each variety was quite withered. The straw was quite worthless and there was no grain at all. Rust did more harm than usual in the district owing to cloudy weather and unseasonable rain but nowhere could the results have been more disastrous than on our experimental plots. In other countries, particularly in the Australian Colonies, protective measures against rust are in force, but expert enquiry as to remedies has so far failed to show how rust can be prevented. No variety of wheat except perhaps khapli or jod wheat is rust-proof, but some varieties are much less liable to attack than others. Rust attack depends almost entirely upon climatic conditions. It has not been proved that the grain from a diseased crop will when sown as seed produce another diseased crop as is the case with other common fungoid diseases which attack cereals.

Fruit.

30. A fig plantation has been established on land which is commanded by an excellent well and which was reclaimed from waste at considerable cost. The trees are thriving. Guinea grass occupies the space between trees. A number of the best varieties of Bombay mango grafts, including a few Pakrias, have been planted along borders. A large number of Egyptian date seedlings are in a nursery, but they do not bear transplantation.

Ensilage.

31. An ensilage stack was made of coarse grass, which, owing to the wet season, could not be made at the time into hay. It is pretty well established that when good hay can be made there is no economy in making ensilage. There is no doubt that coarse fibrous grass can be made more palatable and probably more nutritive by being ensiled. But the wastage, which invariably results in India, however carefully the process is conducted, is a serious disadvantage. It was the intention to have converted into hay the grass which was used in making the ensilage stack, but rain fell heavily and the grass bundles, which otherwise would have been spoiled, were stacked wet. The stack was built like the body of an ordinary hay-rick. It took two days to raise it to a height of 12 feet. It was allowed to heat for three days during which time it subsided considerably. It was then weighted with a layer of earth a foot in depth and was protected from rain by a chupper roof. The stack was made in September 1892 and when opened in May 1893 there was found to be about a foot of waste on the top and round the outsides. The stack had sunk to a height of about 5 feet. The ensilage was fed to dry cows and young stock and these cattle continued to eat greedily a fair ration daily until young grass flushed up in June when they refused to eat any more. The ensilage was a nice brown colour and had a sweet aromatic smell. The cattle preferred the ensilage to rather coarse hay with which they had been previously fed.

Accounts.

32. The farm accounts have been kept distinct from dairy and dairy herd accounts. Two balance-sheets are appended showing the financial results of each. The farm balance-sheet shows that the net cost to Government, exclusive of the Superintendent's pay and of cost of new buildings, has risen from Rs. 1,236 last year to Rs. 1,768 this year. This is partly due to an unfavourable season, but is mainly caused by experiments, the value of which cannot be gauged by cost, and by considerable expenditure incurred in getting the farm into neat order and the fields into good condition. A large quantity of manure obtained

from the dairy herd has been applied in heavy dressings to almost every field and although the cost of application is included in this year's expenses, the effect will extend beyond one season. A re-appropriation of Rs. 1,500 from the savings of the Bhadgaon Farm grant for the construction of wire-fencing and buildings on the Poona Farm is not shown in the balance-sheet.

The Dairy and Dairy Herd.

33. The financial results of management are shown in the appended balance-sheet. The profit for the year is Rs. 1,130. This would have been higher if famine prices had not been current for food bought during three months of the year. No interest is charged on invested capital, which amounts to about Rs. 8,000.

34. The herd increased from 93 head last year to 129 head this year as shown in Appendix V. During the year 8 cattle were sold and 10 bought. There are three stud bulls, 51 milch animals and 75 head of young stock. The dairy produce during the year from 51 milk cattle was sold for Rs. 10,981. Cattle food and fooder cost Rs. 7,346. No allowance is made for value of manure produced. If it had been sold it would have realized at least Rs. 2,000. Its application to the fields of the farm has raised the standard of fertility considerably. The up-keep of the young stock has been costly. The cost exceeds the increase in value, and the balance-sheet for the year is consequently unfavourably affected. I must urge the necessity of early orders regarding the establishment of a stock farm. This farm would relieve the Poona Farm of dry cattle and of young stock and reduce the expenditure considerably. At present the young stock are reared under conditions which are by no means favourable. They are grazed on land rented at a high rate from the Cantonment Committee. The grazing ground is open to trespass of every description and necessarily there is considerable risk of the young stock contracting contagious disease. This year "foot and mouth" disease broke out in the herd. Fortunately the symptoms were diagnosed early, and by at once segregating affected animals the disease was confined to about a dozen. Milk cattle when attacked gave little or no milk and never recovered their normal yields. The grazing land is only leased for a year and it would not pay to erect steading except of the most temporary kind. The cattle have no proper shelter and suffer considerably during the rains. The buildings at the Farm are sufficient only for cows in milk and young calves. In addition to the dairy being a profitable institution, Government have benefited by the supply of pure dairy products to the Military hospitals and prison. The difference between the lowest tenders by Gavlis and our rates show a saving to Government of over Rs. 2,000 during the year. There can be no comparison between the purity and quality of our dairy products and those of the Gavlis. The Commissariat indents vary considerably from day to day and to work the dairy profitably it is necessary that sales be made to the general public. The rates fixed for dairy produce sold to the general public are fixed purposely higher than the rates charged at the three private dairies, which are profitably worked in Poona. If a pure supply of milk was not available at the Government Farm the residents of Kirkee, who get their supply from the farm, would keep their own milk cows or buffaloes, and for this reason I am convinced that the departmental dairy interferes in no way with native private enterprize. It gives an opportunity for the systematic study of the milk breeds of India, of breeding specially for milk, and of testing the comparative values of foods and fodder. A great impetus has been given to improved dairying throughout the Presidency by the initiative example of the department. I believe that improved machinery to the value of nearly two lákhs have been sold by the agent of the dairy supply company. The troops in garrison at Hyderabad, Deccan, are supplied from a dairy farm established by private enterprize there. About sixty milk cattle mostly Surat buffaloes were bought in Bombay when the farm was started. The demand steadily increased until the farm was unable to meet it, and it is noteworthy that the increased demand was met by sending from Bombay daily 75 lbs. of butter which had been churned in Bombay from cream separated at Nadiád and railed as cream to Bombay. The far-reaching influence and advantage of improved dairying throughout the Presidency could be detailed at great length. It is sufficient to know that private enterprize will extend the good work for the best of all reasons—It pays.

35. In April of this year we salted and packed butter in earthen-ware jars which were fitted with close-fitting lids. Each jar held about 25 lbs. of butter and seven were filled. Special care was taken to wash the butter thoroughly before it was salted. The best refined table salt was used. Before it was mixed with the butter it was powderd very fine with a roller (an empty bottle does well for the purpose). 8 oz. of salt were used for 12 lbs. of butter. This is equivalent to approximately 4 per cent. salt, which is heavy salting. The salt was mixed through the butter by thorough working on the butter-worker, a little salt being sprinkled on the butter each time the butter-worker kneaded it. During July the butter as required was removed from the jars, placed on the butter-worker, where the salt was washed almost completely out by means of pure cold water, and the free use of the butter-worker. At no time was the butter touched by the hand. It was sold as fresh butter, and the most expert dairyman could not have detected that it had not been churned the day before. The butter was made with the object of supplying district officers, in camp, in the fair season, but a sudden demand for fresh butter arose during July and it was met in the manner described.

36. There is little to add to the information contained in my note on the dairy herd published as an appendix to the annual report, 1891-92, of the Department of Land Records and Agriculture. In the light of further experience I have no reasons to modify the information contained therein. I submit below a tabulated statement which gives details of the milk yield of buffaloes and cows in milk during the year. The figures relative to yields of animals, which were not dry at the end of the year, are excluded in this statement, but will be given in next year's report. I may note that nine Sind cows were bought in the neighbourhood of Karáchi soon after the end of the financial year and these promise to excel as milk cattle any that we have yet tried. They were selected for the farm by me at the same time as a consignment of 25 was sent for the Ceylon Government Dairy Farm at the School of Agriculture, Colombo. The Sind cows are docile and are remarkably good milk cattle. Well selected animals have a characteristic type and a "breedy" appearance, which indicates that the zamindárs of Sind know something of cattle breeding. Ten of the thirty-four purchased were the pick of a herd of 280 cows owned by a rich zamindár:—

Buffaloes.

Number.	Name.	Breed.	Date of calving.	Number of days in milk.	Maximum yield.	Average yield.	Total yield.	Date of birth of next calf.
			D. m. y.		Lbs. ozs.	Lbs. ozs.	Lbs.	D. m. y.
1	Champá	Jáfrábád ...	5 2 92	369	23 12	12 12	4,775	28 5 93
2	Rami	Do. ...	26 5 91	442	23 12	13 5	5,902	15 12 92
3	Asmán	Surati ...	26 11 91	312	18 4	14 2	4,411	20 11 92
4	Kesar	Do. ...	7 9 91	335	20 8	12 3	3,763	14 1 93
5	Mohan	Do. ...	7 9 91	325	22 0	13 8	4,393	24 11 92
6	Rupá	Do. ...	7 9 91	327	24 0	11 3	3,667	21 12 92
7	Chandni	Do ...	7 9 91	336	20 0	11 10	3,973	4 12 92
8	Khándi	Do. ...	13 6 91	459	24 4	14 8	6,669	20 1 93
9	Awdi	Do. ...	7 9 91	358	17 12	11 7	4,089	19 12 92
10	Mukhran	Do. ...	16 6 91	436	19 8	12 1	5,281	15 1 93
11	Mahitab	Do. ...	7 9 91	251	14 12	9 7	2,375	22 9 92
12	Bichwá	Do. ...	13 6 91	372	23 0	13 15	5,206	4 12 92
13	Chakkar	Do. ...	13 6 91	439	23 0	12 10	5,566	6 5 93
14	Tikkal	Do. ...	13 6 91	342	20 12	12 14	4,411	18 7 93
15	Pádi	Do. ...	13 6 91	333	17 0	9 2	3,044	16 11 92
16	Lali	Do. ...	31 3 91	381	23 0	15 9	5,931	14 8 92
17	Thaki	Do. ...	31 3 91	412	21 8	12 10	5,227	10 9 92
18	Kapeli	Do. ...	31 3 91	382	21 12	11 9	4,432	15 9 93
19	Chandri	Cross	17 10 91	293	22 0	11 13	3,474	14 12 92
20	Hirá	Do. ...	24 11 91	261	16 4	8 12	2,293	21 1 93
21	Dasrath	Do. ...	24 4 91	496	15 12	9 3	4,556	7 1 93
22	Devli	Deccan ...	26 11 91	260	22 8	12 6	3,212	20 12 92

Cows.

1	Jamni	Aden	22 1 92	349	23 4	14 5	4,998	12 7 93
2	Bhagi	Do. ...	7 10 91	366	10 4	7 3	2,650	5 11 92
3	Gowlan	Gir	13 5 91	461	15 4	7 9	3,408	7 10 92
4	Pari	Do. ..	8 8 91	249	19 12	7 0	1,755	31 10 92
5	Sárgi	Do. ...	13 5 91	471	18 4	10 10	5,024	13 10 92
6	Siti	Do. ..	13 5 91	404	15 0	10 0	4,055	23 10 92
7	Sundri	Surti	12 2 92	179	11 12	6 11	1,192	Sold
8	Kashi	Aden Gir cross.	5 3 92	255	15 8	10 6	2,645	29 7 93
9	Bahuli	Do. ..	14 8 91	315	13 12	9 13	3,101	16 6 92

The average number of days between two calvings are—

22 buffaloes' average—524 days.
8 cows' average—475 days.

The average period of lactation for the same number was—for buffaloes 364 and for cows 360 days.

37. A record has been kept during the year of the average amount of butter obtained from buffaloes' milk. It has been possible to feed to the milch cattle a moderate quantity of green fodder during the whole year, and consequently there is not now that difference which was previously noted in respect of the average amount of butter fat in milk at different seasons. Formerly in the hot weather buffaloes' milk was much richer than that produced in the rains and afterwards when a good deal of the food is succulent.

During February, March, April and May the average weight of milk required to produce a pound of butter was 11 lbs. 7 ozs.

Similarly for June, July and August the average was 12 lbs. 8 ozs.

Analysis made by the Assistant Agricultural Chemist of the milk samples taken as average of Sind cows and of farm buffaloes gave the following average results :—

SIND COWS.

Analysis of average Samples of Milk from nine Cows. The Cows all calved in May 1893.

Constituents.	Morning Milk.	Evening Milk.	Remarks.
Water	86·75	85·91	
Fat	4·29	5·42	Average of six analyses made between 10th July and 28th August 1893.
Casein	3·12	2 95	
Milk sugar	5·28	5·40	
Ash	·70	·69	

BUFFALOES.

Analysis of average Samples of Milk from whole Buffalo herd numbering 27 heads.

Constituents.	Morning Milk.	Evening Milk.	Remarks.
Water	82·99	81·92	
Fat	7·92	8·10	Average of four analyses made between 10th July and 28th August 1893.
Casein	3·98	4·02	
Milk sugar	4·98	5·39	
Ash	·78	·80	

Statement showing relative proportion by weight of butter fat to milk in the average daily yield of Sind cows and of the whole buffalo herd.

Description of Animals.	Average quantity of Milk per head in one day.		Average quantity of butter, fat per head in one day.		Remarks.
	Lbs.	Ozs.	Lbs.	Ozs.	
Cows (Sind)	13	14	...	9·87	Equivalent to 1 lb. butter from 22·3 lbs. milk.
Buffaloes	9	2	...	14·37	Equivalent to 1 lb. butter from 11 lbs. milk.

Mr. Collins had no time whilst in Poona to analyse Aden, Gir and cross bred-cows' milk, but the butter fat percentages of Aden cows' and Gir cows' milk as indicated by Soxhlet's apparatus show that these breeds are at least equal to Sind cattle as butter producers.

38. It will be noted that the evening milk is in each case richer in total solids than the morning milk. Water drunk immediately before milking or succulent food eaten then is supposed to produce an increased yield of poor milk. The difference shown by analysis cannot be accounted for in this way. The quality of the evening milk could be lowered by the succulent food and water which is usually given soon before milking, but the morning milk could not possibly be affected in this way. The true explanation has to be looked for otherwise and this is found in the fact that thirteen hours elapse between evening and morning times of milking, whilst only eleven hours elapse between morning and evening times of milking. The longer period seems to allow the animals sufficient time for full milk secretion. The difference in actual yield between morning and evening is shown as under:—

	Morning yield.		Evening yield.	
	Lbs.	ozs	Lbs.	ozs.
Total yield of 9 Sind cows	72	8	52	13
Total yield of 27 buffaloes	162	6	153	3

Establishment.

39. I can give unqualified praise to Mr. Kelkar, the acting Superintendent of the Farm, who has done very good work both on the Poona Farm and at Bhadgaon. He was transferred to Poona last March. Mr. Káshináth Thamáji has worked hard at Bhadgaon and Poona. He as well as Mr. Kulkarni, the Poona Farm Clerk, have learned to manipulate improved dairy machinery and are each of them expert dairy-men and are perfectly capable of teaching apprentices thoroughly. I cannot help saying that should it be found possible to give the three subordinates mentioned above facilities for attending the agricultural course of lectures at the College of Science with the object of passing the Bombay University Examination for the diploma in agriculture, they would make much more satisfactory students and much better Government servants afterwards than the students who are attached to my classes now. An apprenticeship on a Government Farm should in every case precede a College Training in Scientific Agriculture, and the scholarships awarded at present to agricultural students would in my opinion be more usefully employed in paying apprentices for defined duties on a Government Farm, who if they proved their worth could be afterwards encouraged to go through the College agricultural course.

J. W. MOLLISON,

Superintendent of Farms, Bombay Presidency.

7th October 1893.

APPENDIX I.

Balance Sheet of the Poona Farm, 1892-93.

Receipts.	Rs. a. p.	Amount. Rs. a. p.	Expenditure.	Rs. a. p.	Amount. Rs. a. p.
To Sale-proceeds from Farm produce of 1892-93—			By rent of land	.....	122 0 0
Grains	10 12 0		Assistant Superintendent's pay	.....	1,208 3 9
Fodder crops	809 15 2		Establishment pay	.....	537 7 3
Sugarcane	30 2 3		Horse allowance	.....	240 0 0
Vegetables	65 14 3		Travelling allowances	.....	26 0 0
Miscellaneous receipts	45 7 1		By ordinary expenditure—		
Fruits	36 1 6	998 4 3	Labour	1,680 5 7	
To value of Farm produce of 1892-93, unsold on 31st March 1893—			Skilled labour	29 5 6	
A.—Since sold—			Purchase of manures	26 0 4	
Grains	75 2 8		Purchase of seeds for sowing	238 6 7	
Potatoes	99 15 1		Do. dead stock	97 0 0	
Fodders	145 6 5		Do. stationery and Service Stamps ...	40 9 3	
Vegetables	0 8 6		Miscellaneous expenses	116 3 0	
Mangoes	40 11 0	361 11 8	Charges for irrigation water	28 15 0	
B.—On stock—			Repair of implements	28 9 0	2,285 6 3
Grains	4 0 0		By cost of fencing and buildings	.....	500 0 0
Potatoes	38 7 9		Net cost of bullocks	.....	479 15 4
Fodder	46 12 2				
Lucerne and Guinea grass-value of growing crop and establishing plantation ...	190 0 0	279 3 11			
To net increase of dead stock	.....	43 9 0			
Total ...	.....	1,682 12 10			
To net cost ...	.....	3,716 3 9			
	.....	5,399 0 7			5,399 0 7

APPENDIX II.

Dairy Balance Sheet for 1892-93.

Income and Increase in value of Stock.	Amount.			Expenditure.	Amount.		
	Rs.	a.	p.		Rs.	a.	p.
To sale of milk and butter the produce of Farm cattle.	10,981	0	9	By concentrated food bought ...	4,269	5	0
				„ Fodder bought ...	1,514	12	8
To butter on hand on 31st March 1893.	69	8	0				
				„ Rent of grass land ...	1,130	0	0
Increase in value of Dairy herd and young stock.	625	0	0	„ Hay making expenses ...	432	6	3
				„ Labour	1,635	1	6
Value of hay in stock ...	450	0	0				
				„ Horse and bullock hire ...	44	9	6
Increase in value of dead-stock	240	0	0				
				„ Water-rate	25	9	7
				Cost of repairs and incidental outlays incurred for management of Dairy and Dairy herd.	1,051	7	7
				Purchase of milk cart and Dairy machinery.	306	2	0
				Purchase of 2 horses for Dairy cart.	190	0	0
				Purchase of 6 buffaloes and 4 cows.	545	0	0
				Erection of temporary cattle-shed.	90	9	10
				Total ...	11,234	15	11
				Profit ...	1,130	8	10
Total ...	12,365	8	9	Total ...	12,365	8	9

APPENDIX III.

Working Bullocks.

Receipts.	Amount.	Expenditure.	Amount.		
			Rs.	a.	p
Nil	.....	By cattle food and fodder ...	396	4	4
		Ropes, &c.	20	11	0
		Shoeing charges ...	8	10	0
		Medicines	1	6	0
		Wages	36	0	0
		Decrease in value ...	17	0	0
		Total ...	479	15	4

APPENDIX IV.

Variation Statement.

Description.	Stock on hand on 31st March 1892		Stock on hand on 31st March 1893.		Increase.	Decrease
	Number	Amount.	Number	Amount		
		Rs. a. p.		Rs. a. p	Rs. a. p	Rs. a. p
Working bullocks ...	4	177 0 0	4	160 0 0	...	17 0 0
	4	177 0 0	4	160 0 0	...	17 0 0
Dead Stock.						
Farm implements ...	...	439 0 0	..	485 11 0	46 11 0	...
Office furniture... ..	...	66 6 0	...	63 4 0	.	3 2 0
	...	505 6 0	...	548 15 0	46 11 0	3 2 0
				Net increase ...	43 9 0	...

APPENDIX V.

Dairy Herd.

Description	Strength on 1st April 1892.	Increase.			Decrease.				Strength on 31st March 1893.	Re-classification on 1st April 1893.	Valuation.		Increase or decrease during 1892-93
		Purchased.	Born.	Total	Sold.	Died	Transferred to working stock	Total.			1892.	1893.	
Stud bulls	3	..	...	...	...	...		...	3	3	135	140	+5
Cows... ...	17	3		3	6		...	6	14	14	800	705	—95
Heifers ...	10	...	...	...	...	...	...		10	10	100	185	+85
Bull calves	8	.	7	7	2	2	...	4	11	11	55	105	+50
Cow calves ...	6	1	6	7	...	2		2	11	11	30	85	+55
Total ...	44	4	13	17	8	4		12	49	49	1,120	1,220	+100
Buffaloes													
She-buffaloes	33	4		4			...		37	37	3,470	3,590	+120
Heifers	...		...			.	...		..	...	.	...	..
Bull buffalo calves	6	1	16	17	..	4		4	19	19	30	120	+90
She buffalo calves ...	10	1	13	14				..	24	24	70	195	+125
Total ...	49	6	29	35		4		4	80	80	3 570	3,905	+335
2 Dairy cart horses .	...	2	...	2	...	...	...		2	2	.	190	+190

Review on the Annual Report of the Nadiád Farm for the year 1892-93, by J. Mollison, Esqr., M.R.A.C., Superintendent of Farms, Bombay Presidency.

1. The report of the Nadiád Farm for 1892-93 is uninterestingly brief. The tabulated statement which accompanies the report, as well as the cultivation book, each contain useful information. I will endeavour to extract from these, as far as I can, the results of the year and try to show causes for failures as also reasons for good results. I have only been an occasional visitor at the farm and therefore the analysis of results which ought properly to be done by some one connected with the Society must necessarily be imperfectly performed.

2. *Season.*—Throughout Gujarát, the season for staple crops especially for bájri and tobacco was most unfavourable. The rainfall although over average was unseasonable. Bájri suffered, because rain in quantity fell when it was in flower. The stamens hang outside the spike in such a way that fertilization is prevented if heavy rain falls when the pollen is being shed. An excessive rainfall late in the season rotted the straw, and throughout gorádu tracts bájri was comparatively a failure. So also were other cereals. Tobacco, too, suffered from an unfavourable season. Seedlings succumbed at time of transplantation and afterwards, and nearly every tobacco field in the tobacco-growing districts, like the plots on the Nadiád Farm, presented an irregular patchy appearance.

3. If the entries in the cultivation book indicate accurately the net results of cultivation in the year under report, the results are not unsatisfactory. I have totalled the figures and find that on the cultivated area (7 acres 26 gunthas) the cost of cultivation amounts to Rs. 248-15-2; the value of outturn to Rs. 177-2-4 (unsold tobacco being valued at Rs. 19-8-3); loss Rs. 71-12-10. This represents a loss of Rs. 9-6-2 per acre as compared with about Rs. 3 last year. I cannot reconcile the figures in the cultivation book with the outlays on the farm. Excluding extraordinary expenditure, and the Superintendent's pay, the report shows that the following expenditure was incurred :—

	Rs.	a.	p.
Pay of farm servants	200	10	8
Purchase of seeds	25	4	0
Purchase of manure	50	13	5
Feeding charges of farm cattle	31	4	7
Labour charges	91	15	3
Total ...	399	15	11

This total exceeds the cost of cultivation by Rs. 150, and this difference can only be explained by the supposition that the farm-labour was employed otherwise than on the farm.

4. The Society's seed store has made decided progress. For several years the transactions were almost stationary. This year as compared with last they have almost doubled. Seed was sold to the value of Rs. 309 and the distribution was effected at a cost of one rupee and a half on cost price. The rent of the store and the storekeeper's pay with other contingent expenses (amounting together probably to Rs. 100) are I think not included. But even if this amount has to be added to that shown in the report, the Committee are to be congratulated upon their persevering in an undertaking which is now doing good and will eventually do much good. This year's distribution means that pure seed sufficient to sow about 800 acres has been sold. And the benefit does not end here. For every cultivator, who buys at the seed store, will take care of the produce if the seed he had bought has proved itself a success.

5. The Association's contribution to the Veterinary Dispensary (Rs. 150) is continued as usual. It is not quite so satisfactory to note that a Rs. 5 per month scholarship to agricultural pupils of the Nadiád High School has been discontinued.

6. A new scheme of experiment has been in progress for two years. Of course it has not been sufficiently long in progress to draw definite conclusions yet; and this year's results are vitiated to some extent as they were last year by unfavourable climatic conditions. The first series of plots compare continuous tobacco and tobacco in rotation. They also afford a comparison between exotic and indigenous varieties. Tobacco is rotated with guvár and bájri. The crops are taken in the order named. Three plots are thus cropped. The three next adjoining plots are occupied by continuous tobacco with the object of showing a comparison between indigenous, Havanna and Virginian sorts as well as with the rotation tobacco plots. The report does not show the relative prices obtainable for indigenous and exotic varieties; but in this—an unfavourable year—the indigenous sort gave much the better outturn. The crops on all the plots were however poor. Guvár unmanured taken after tobacco, heavily manured, this year yielded well, but not so well as last year. The crops of both years were unmanured. The relative seed-rates and outturns are shown below :—

Year.	Seed per Acre.	Outturn per Acre.	
		Grain.	Straw.
	Lbs.	Lbs.	Lbs.
1891-92	12	1,630	2,025
1892-93	12	955	1,235

The difference between this year's bájri crop of this series and last year's is also striking. The difference as shown below is attributable to season to a greater extent than that noted in respect of guvár. The bájri was unmanured this year as well as last :—

Year.	Seed per Acre.	Outturn per Acre.	
		Grain	Straw.
	Lbs.	Lbs.	Bundles.
1891-92	10	860	400
1892-93	10	312½	555

The effect of season is well shown this year by the small yield of grain in comparison to the straw.

7. The cultivation of cotton has received a good deal of attention for year on the Nadiád Farm, and it has been conclusively proved that American cotton which is now so discredited, has proved itself a failure in Gujarát as it has done in other districts. Its cultivation even experimentally should therefore be stopped forthwith and the Association should not offer American seed for sale at its seed store. It might be of advantage, if, instead of American, the Society thoroughly tested good-stapled cottons indigenous to Gujarát which have not yet been grown experimentally. Lalia, a long silky stapled cotton grown extensively near Ahmedabad is at least worthy of trial; and the present comparisons, between the Ghoghári and Deshi varieties should be persevered with until definite conclusions are arrived at. The results of this year and last year tend to prove that there are good grounds why Ghoghári—which is a cotton somewhat inferior to pure Broach—is making headway against the Deshi variety in the Broach District. Both show a vast superiority over American. Broach and American grown under like conditions gave the following results :—

	Seed per acre.	Outturn per acre	
		Seed cotton.	Lint.
	Lbs.	Lbs.	Lbs.
Broach (Deshi)	8	307	104
American	8	121	36

The comparison between Broach and American cotton (Ghoghári or Lália should be substituted for the American in future years) is taken advantage of to study the effect of good rotation also. Jowári and safflower (kusumbi) are rotated with each variety of cotton; and because it is believed to be a good practice, the jowári is the only crop of the rotation which is manured. The residue of manure left is expected to benefit the cotton grown the following year, and to extend to the kusumbi grown in the third year The plan of experiment has not been strictly followed out. The plots under kusumbi were this year manured because they had received no manure for several years, and it was improbable that kusumbi would thrive in exhausted soil. It will be possible in future years to adhere strictly to the proposed line of experiment.

8. The jowári plots were each manured with castor cake 500 lbs. per acre, and the following tabulated figures compare the results this year with those of the last:—

	1891-92.		1892-93.	
	Grain.	Fodder.	Grain.	Fodder.
	Lbs.	Bundles.	Lbs.	Bundles.
American cotton rotation ...	1,625	700	197½	685
Broach cotton rotation ...	1,875	940	167½	660

The difference in yield of grain is almost entirely attributable to season.

9. In regard to safflower (kusumbi) the difference between this year's yield and that of last is not so marked. Safflower is a rabi crop, and probably the heavy rains which proved so disastrous to cereals were beneficial to it. The following figures compare the yield of 1891-92 with those of this year:—

	Outturn per acre 1891-92.		Outturn per acre 1892-93	
	Seed	Flowers.	Seed.	Flowers
	Lbs.	Lbs.	Lbs.	Lbs.
American cotton rotation ...	960	111¼	605	87½
Broach cotton rotation ...	986¼	115	695	110

The figures tabulated under heads of "flowers" represent the weight of petals plucked for dye.

10. Four plots are allotted to an experiment on bájri with subordinate pulses, in comparison with bájri alone, rotated with tur and potatoes. It is generally believed that the cultivator avoids risk by growing a mixed crop rather than depending entirely on a sole crop That there are good grounds for

this belief is well shown by the results of this experiment this year. This year owing to heavy unseasonable rain, the season was most unfavourable for all cereals but was favourable for the more vigorously growing pulses. Bájri alone gave :—

1891 92.		1892-93.	
Grain.	Straw.	Grain.	Straw.
Lbs.	Bundles	Lbs.	Bundles.
755	390	217	490

In comparison with the above I note below the result this year and last from the mixed crop plot :—

Crops.	Per acre.		
	Seed rate.	Outturn, 1891-92, Grain.	Outturn, 1892 93, Grain.
	Lbs.	Lbs.	Lbs.
Bájri...	6	520	115
Mug...	1	42½	20¼
Muth	1	35	5
Chola	1½	261¼	200
Tur	2	120	201¼
Total ...	...	978¾	541½

It will be noted that both this year and the last (a favourable and an unfavourable year), the bájri with subordinate pulses, has had a decided advantage over bájri alone.

11. Tur unmanured after bájri unmanured, gave this year as it did last year, an extraordinary outturn. The respective outturns are 1,949 lbs. of grain per acre this year and 2,200 lbs last.

12. Potatoes again failed. The only reason vouchsafed was that they were eaten by insects. The seed rate is entered at 440 lbs. per acre, just one-third of what it ought to be. On the garden land near Nadiád potatoes do well and there is no reason why they should not succeed on the Nadiád farm. I have asked the committee to try the English seed to be imported this year.

13. Three plots have been set aside for a "bájri unmanured rotation" experiment. The object is to see how long bájri in rotation with castors and tur can be grown on land, that, although not manured will be thoroughly tilled every year. The results this year as compared with last year are tabulated below, not for the sake of comparison, but to put them on record so that continuity can be maintained in future years :—

Year	Outturn per acre.		Outturn per acre.	Outturn per acre.
	Bájri.		Tur.	Castors
	Grain.	Straw.		
	Lbs.	Bundles	Lbs.	Lbs.
1891-92	400	290	1,025	532½
1892-93	195	405	1,195	285

Other results do not call for analysis this year. They can be remarked upon better when the scheme has been under trial for a few years.

14. The testing of seed got some attention in the year under report. White and chocolate barley (both huskless) were successfully grown. The former variety was some years since considered a good sort by English maltsters and might perhaps be introduced successfully into the Ahmedabad District, where barley is largely grown. I doubt if there is any practical advantage in either growing chocolate coloured barley on the farm or of distributing its seed. From a maltster's point of view the colour would be against it.

15. White jowár gave a fair outturn; but the giant bájro did no better than the common country sort. The advantage of growing bájro is, however, thoroughly established and its seed is being widely distributed. A small lot was sent all the way to Hyderabad, Sind, from the Nadiád seed-store.

16. I must direct attention to the fact that the straw or fodder from all plots should be weighed and not recorded as so many 'bundles'. The outturn of tobacco this year is also noted in bundles and not its actual weight. The Honorary Secretary complains that owing to the transfer of the Superintendent, the records were incomplete. The report and the tabulated statements are certainly less satisfactory than they were last year.

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Superintendent of Farms, Bombay Presidency.

20th October 1893.